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AN ASSESSMENT OF THE POTENTIAL OF COAL DEPOSITS IN EGYPT, AND FUTURE PROSPECTS

AN ASSESSMENT OF THE POTENTIAL OF COAL DEPOSITS IN EGYPT AND FUTURE PROSPECTS

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CONTENTS

1- HISTORICAL REVIEW.

2- PRESENT STATUS.

3- COAL OCCURRENCES IN EGYPT

3.1- SINAI COAL DEPOSITS.

3.1.1.- Maghara Coal Field.

3.1.2.- Ayun Musa Coal Deposit.

3,1.3.- Bedaa-Thora Carbonaceous Shales

3.2- Western Desert Occurrences:

4- DEVELOPMENT OF MAGHARA COAL FIELD.

4.1- Exploration.

4.2- Evaluation of Reserves.

4.3- Development of Safa - Mine.

4.4- Additional Coal reserves at Maghare.

5- UTILIZATION OF COAL:

5.1- Metallugical uses.

5.2- Electric Power generating.

6- FUTURE PROSPECTS.

6.1- National Five-year Economic Development Plan (1982 - 1987)

7- CONCLUSIONS

AN ASSESSEMEMENT OF THE POTENTIAL OF COAL DEPOSITS IN EGYPT AND FUTURE PROSPECTS

A B S T R A C T

The discovery of the Maghara coal field of Northern Sinai, being achieved in 1959, by the Geological Survey of Egypt, was considerd as a turn point in the search for economic coal deposits in the country . Prior to that, trials were made Since 1840, to explore coal that all showed negative results as being not based on sound geological basis. During the exploratory drilling for oil, occurrences of coal seams and carbonaceous matter were recorded at numerous sites, being mostly found at prohibitive depths. The appraisal and investigation of the drilling records, threw much light on the promising occurrence of coal in Jurassic sediments, which being found exposed in Northern Sinai, were the field of detailed geological exploration This systematic search lead to the discovery of coal deposits at Maghara Massif in Northern Sinai, and at Ayun Musa area in West Central Sinai.

The development of the Maghara coal field was actively run as starting from 1967, when the first coal mine in Egypt, the Safa Mine was about to start its production. These activities, as well as all other geological operations ceased in Sinai during the period 1967 - 1981. After that, a feasibility study was carried during the Year 1982 to Re-open the Safa Mine and to study the optimum utilisation of its coal.

At present, the consumption of coal in Egypt, is mainly for metallurgical uses, but plans are under consideration for its use in electric power generating

The present study, is a review of the position of coal in Egypt, and its role in accelerating the economic growth of the country.

I. HISTORICAL REVIEW:

I.1. Search for coal in Egypt, Started early in 1844, by digging an open well near Idfu, in southern Egypt, in the Nubian SANDSTONES (upper Cretaceous). Very thin intercalations of bituminous Carbonaceous matter were then recorded at a depth between 53-76 m below ground surface. This result was disappointing thus no other search was followed by that time.

I.2. During the period 1903-1906, some companies had interest in coal and a few open wells were dug at different sites, in southern Egypt and in Sinai Peninsula, that all showed no records for the possible Occurrence of economic coal deposits. The selection of these sites was not based on any sound geological considerations.

I.3. In the course of the regional geological mapping, carried out by the GEOLOGICAL SURVEY OF EGYPT, early in this century, H.J. Beadnell (1905) recorded the occurrence of lignitic bands and lumps within a sandstone bed, (7m) in a section of clay-limestone measured at Gasr-El-SAGHA, at the northern borders of Fayum depression, at a distance of 80 km southwest of Cairo.

In 1916, J. Ball, recorded other occurrences of carbonaceous matter, and carbonaceous shales within Carboniferans sediments in Sinai Peninsula.

1.4. After the second World War, during the course of drilling for Oil, occurrences of differnt coal types and carbonaceous matter were recorded at dofferent sites in northern Egypt, especialy in the Western Desert. These were recorded at depths ranging between 275 to 1190 m, within Jurassic and lower Cretaceous sediments. Other similar occurrences were recorded in Sinai and in the northern regions of the Estern Desert at depths from 418 to 2960 m within Jurassic and Carboniferous sediments.

1.5. In 1956, the Ministry of Industry started the execution of a systematic programme for the search of coal on sound geological basis. This programme entailed the investigation of all basic geological date compiled From the records of deep drilling for oil. This resulted in the identification of regions with prospective coalbearing geological formations. Consequently a

programme for coal prospecting was EXECUTED through drilling, at ayun musa area on the gulf of suez, and at bedaa-thora, (west central sinai) in the years 1957-1959 .

I.5. In 1957, detailed systematic geological mapping started in the area of gebet maghara massif in Northern Sinai. this resulted in the discovery of coal measures exposed within the jurassic section that dominates this area, (1959).

I.6. The discovery of this potential coal deposit at Gebel Maghara encouraged the Ministry of Industry to concentrate all efforts to develop this coal field. by 1967, the first coal mine at Safa sector was about to start its first production. all mining operations ceased as a result of the Israeli in 1967.

I.6. During the years 1968-1970, the Geological Survey of Egypt carried on deep dilling to explore some locations to the west of the Gulf of Suez, and in the western desert. the results obtained, were not encouraging for further exploration.

2. PRESENT STATUS :

2.1. After the peace Agreement, between Egypt and Isreal, was signed in 1979, and as soon as the norther area of Sinai was Liberated in 1980, the Egyptian Geological Survey, supervised a programme to re-open the safa coal mine at Maghara.

2.2. In 1982, a feasibility study was carried on this mine to check the condition of the underground workings, to plan for a new project to exploit this deposit, and to identify the optimum use of coal for local industrial activities.

3. COAL OCCURRENCES IN EGYPT

3.1. SINAI COAL DEPOSITS.

The most promosing coal deposits, so far known in Egypt, are those found in Sinai Penisula, at Maghara (north Sinai), at Ayun Musa (just south-east of Suez city) and at Bedaa-Thora (in west middle Sinai)

3.1.1. THE MAGHARA COAL FIELD:

I- The coalfield of Maghara is located in

the centre of Northern Sinai, at a distance of 90 km S.W. of El-Arish city.

2- Geological prospecting for coal was first directed to this district in 1957, just after the discovery of coal in the Jurassic formations in Ayun Musa area. The coal bearing formations in the Jurassic section are found exposed in the district of Maghara due to the prominent folding of the strata.

3- The detailed and careful study of the geological section threw much light on the occurrence of Bajocian-Bathonian formations of deltiac and nearshore environments of deposition within which the first coal seams were discovered in 1959. This was followed by detailed geological mapping of the whole area of Gabel Maghara massif. By drilling a series of bore-holes and open pits the lateral extension of the coal seams was followed as well as thier vertical position within the coal measures.

4- The Jurassic section exposed at Jaghara measures more than 1900 m in thickness. The section contains 54 % carbonates, 31 % clays and 15 % sands. The cyclothemic behaviour of the sedimentation is quite obvious in the coal-bearing formations of the continental facies of this section.

5- The coal measures belong to a formation known as Safa Formation of BAthonian age. The thickness of this formation is 215 m, and the lime: clay: sandstone ratio is 49:37:34. The lower portion of this formation is coal-bearing. At least eleven coal seams are present, of which two seams are of valuable extension, being known as the main and the upper coal seams of the Safa sector of the Maghara coal field.

6- Besides this Safa Formation, other Two formations of non - marine to continental facies exist within the Jurassic section, these being the Mashabba Formation (100m) and the Shusha Formation (27/m). the main bulk of their strata is of deltaic, lagoonal swampy and estuarine character. They contain fossil plant and/or coal seams not so

far explored, as being found at deeper horizons.

7- Prospecting for coal in Maghara area started early in 1959 by the construction of detailed geological maps that covered most of the area of the coalfield., A number of 84 boreholes had been drilled in the area up to 1967. The total meterage of drilling was 18360 m, covering an area of 25 KM^2 known as the Safa Block. The results of the surface geological mapping and detailed drilling with the analyses of the coal cores proved:

A- The extension of the Bathonian coal bearing series (Safa Formation) with an average thickness of 160 m.

B- The series encloses up to ten coal seams of thich only two, the main seam, and the upper seam attain considerable thickness to be regarded as economic.

C- The upper seam attains a thickness of 60 cm. Its position is 8-10 m above the main seam.

D- The main seam varies in thickness from 110-190 cm. and averages to 135cm.

E- Groundwater exists as a potential source in the area of Safa block.

8- Reserves at Maghara: The total reserves of coal measured within the area explored up to I967, (25 km^2) amount to :

- Proved reserves	39.9	million tons.
- Probable reserves	II.9	" "
Total	5I.8	" "

The net workable reserves, which could be mined in this area were evaluated as:

- Proved reserves	27.8	million tons.
- Probable reserves	7.8	" "
Total	35.6	" "

9- In I964, the first coal mine in Egypt, the Safa mine started to be developed, and by I967, it was about to start production, which was planned as 300,000 tons per annum to be raised to 600,000 tons after 3 years. All these operations ceased due to the Sinai war of I967.

IO- QUALITY OF THE COAL:

Both the upper and main coal seams show similarity in their characteristics. The coal is of homogenous composition and is a high volatile coal with coking properties, which according to the various classification systems could be indentified under the following rank:

1- Seylers, classification:- per-meta-lignitious.

2- British National Coal Board (N.C.B.) class 702.

3- International classification:- Code No. 622, where :

- Class-6-indicates coal with volatiles over 40%, and calorific value between 7750-8430 cal/gm.

- Group -2- Indicates coking properties as
  - Free swelling index 2.5-4
  - Roga index 20-45
- Subgroup-2- Indicates coking properties:
  - Dilatometer test = 0
  - Gray King coke type E-G.

4- A.S.T.M: Sub-bituminous A-coal.

5- Regnault-Grumer classification:
   - coking-long Flame bituminous.

6- Matte classification:-
   - Per-Hydrous high volatile resinous coal.

II. CHEMICAL ANALYSES

II.1- Proximate analysis:

Moisture	4.9	%
ASH	6.5	%
Volatile matter	50.7	%
Fixed carbon	37.9	%
	100.00	%

II.2- Ultimate analysis:

Moisture	4.9.	%
ASH	6.5.	%
Carbon	70.66	%
Hydrogen	5.67	%
Nitrogen	1.04	%
Sulphur (combustible)	2.97	%
Oxygen (by difference)	8.26	%
	100.00	%

II.3- Other Data:

- Calorific value (cal/gm) 7270
- Swelling number 2-3
- Gray King Assay (at 600c°) coke type F-G and up to G2.
- Chlorine 0.064 %
- Phosphorous 0.004 %

II.4- Comments on chemical properties of Makhara coal:

- Both coal seams show a similar chemical composition.
- The inherent ASH content of the coal ranges from 7-IO %.
- The ASH contains rare elements.
- The sulphur content is rather high due to the presence of pyrite.
- Calorific value is high due to the high hydrogen content.
- Results of swelling tests show no appreciable expansion on carbonization and the coal exerts no excessive side pressure on the walls of the carbonization ovens.
- Carbonization experiments on the coal gave the following results on laboratory scale:

YIELD/TON

Gas	353	M^3
Calorific value	6720	K/cal per one M^3 of gas.
Coke	490	kg.
Tar	40	Gallons
Liquor	19.3	"
Ammonium chloride	3.55	kg.

- The proximate analysis of the resulting coke:

Moisture	6.2	%
ASH	11.8	%
Volatile Matter	2.4	%
Fixed carbon	78.6	%
	100.00	%

Calorific value of coke 6900 cal/gm.

- The Maghara coal by itself is not suitable for the production of metallurgical coke, but on blending with strongly coking coals, a satisfactory coke can be produced.

.- METHODS OF MINING:

In the Safa mine, access to the coal seams is by means of two drifts driven from the surface

and a vertical shaft. Both longwall advancing and longwall retreating methods of mining the deposit are planned to be practiced.

3.I.2 AYUN MUSA COAL DEPOSIT:

1- Prospecting for coal at Ayun Musa was carried out in two stages. The first stage started on April 1959 and was completed on April 1961 . The second stage durated from 1961 to 1963 .

The first stage of prospection entailed detailed geological prospecting work, detailed gravimetric exploration and deep drilling . The second stage was the drilling of more deep holes for the estimation of coal reserves.

2- Location: The coal field of Ayun Musa is situated in the coastal area of the Gulf of Suez in the Sinai Peninsula, at a distance of 14 Km S.E. of Suez City.

3- The area explored for coal (70 Km^2) is an open gently undulating country, that is sloping gradually towards the Gulf.

4- GENERAL GEOLOGY:

The area is covered by Quaternary superficial

deposits, that are underlain by Miocene, Cretaceous, Jurassic, Triassic and permo-Carboniferous sediments.

The Coal occurrences are confined to Middle Jurassic sediments, that were prospected by drilling.
The investigated area has its geological structure being related to the Gulf of Suez tectonics. A major dome structure being revealed by gravimetric exploration, was found to be faulted into uplifted blocks through the results of deep drilling.

The Jurassic sediments are found at a maximum depth of 400 M, under a variable thichness of Miocene and Cretaceous sediments. The Jurassic is represented by marine Upper Jurassic beds. The Upper portion of the Middle Jurassic (60-100 m) is of marine and lagoonal marine facies. The middle part of the Middle Jurassic which includes the coal-bearing series is represented by a thichness of 70-100m of closely alternating claystone and sandstone beds, with rare limestone horizons, and several coal seams and thin carbonaceous shales.
The Lower part of the Middle Jurassic sediments is mainly composed of sandstone with claystone intercalations followed by massive limestone.

5- COAL SEAMS:

Several coal seams are recorded within the coal measures, of which two seams attain thicknesses that could make them of considerable economic value. These are a main seam and a lower seam being separated by a vertical distance from 46-60 M. The main coal seam attains a thickness varying from 0.60m up to I.20m, with an average of 0.90m.

The behaviour and properties of the upper main coal seam have been studied in more details than those of the lower seam.

6- COAL CHARACTERISTICS:

6.I The following is a review of the characteristics of the main coal seam:

- Ash content 8.9-33.48 %
- Volatile matter 23.5-5I.4 %
- Fixed Carbon 23.8-6I.0 %
- Carbon content Up to 79.3 %
- Hydrogen content to 7.43 %
- Moisture content 3.6 -I0.49 %
- Sulphur content Up to 3.59 % (Mainly due to pyrite)
- Calorific value 85I2 Cal/gr.
- The coal is a brown coal, with a rather high tar content (Up to 25.75 %)

6.2. The properties of the lower coal seam have not been studied in such details . However its main characteristics are:

- Higher ash content 29-40 %
- Volatile matter 30-40 %
- Fixed Carbon I9-27 %

7- Ground-Water:

The sandstones in the general section overlying and underlying the coal seams are considered as potentially water-bearing artisian aquifers.
The yield of some drilled wells ranges from I03-5I0 M^3 / day. The water temperature being about 44°c, with H_2S odour. the maximum hydrostatic pressure of the Cretaceous water-bearing horizons sometimes reached 80 atmosphores and even more.

8- Mining feasiblity:

The reserves of the main coal seam calculated within the area of investigation, are:

I- Within area drilled (I9,400,000M^2) :
= 2I.0 million tons.
2- Within outlying zones (inferred)
= I9.0 million tons.
3- Total reserves
= 40.0 million tons.

Considering the depth of coal, the presence of

artesian ground-water, and the quality and behaviour of coal, it was found appropriate by that time to concentrate on the development of the Maghara coal field, and to suspend any plans for the exploitation of Ayun Musa coal.

9- The second stage of prospecting entailed the execution of detailed drilling and hydrogeological investigations.

- The results of this second phase showed the coal to occur in a number of seams which are lenticular, and that the two main seams have an Average thickness of 50 cm over the whole area. The considerable changes in thicknesses from one borehole to the other did not enable to measure any proven reserves on sound satisfactory basis.
  Thus the coal reserves of the main seam were evaluated as:
  - Proved reserves: Nil
  - Probable reserves: I8.5 Million tons.

I0- On the light of the esults of this second stage, the Ayun Musa Coal was considered by I963, as of non-commercial type.

3.1.3- Bedaa-Thore Coal Deposit:

1- The Thore-Bedaa deposit is the only coal [illegible] so far explored in the Carboniferous sediments of Egypt. The deposit lies at 25 km east of Abu Zencima port, (on the Gulf of Suez) at the western part of Sinai Peninsula.

2- The prospecting and exploration program was exected through the period from 1959 to 1961. This entailed the construction of detailed geological maps, and the drilling of 20 boreholes besides several adits and pits that were dug in the exposed parts of the coal seams.

3- Geological Setting:

Precambrian Devonian, Corboniferous and Quaternary rocks dominate the area of Thora.
Precambrian outcrops are restricted to the south western part of the area. These are overlain by a clastic section of 0-130m of Devonian-Lower Carboniferous sediments, being well developed in the southern part of the area.

The Lower Carboniferous sediments are lithologically differentiated into two units, a lower calc-dolomitic part (8-45m) and an upper sequence (Coal-bearing) of terrigenous and clayey sediments with coal seams and bands.

- Lithologically, four horizons are recognized in this coal-bearing sequence, being:
  a- An above-coal horizon,
  b- A coal-bearing horizon,
  c- A below-coal horizon,
  d- A doleritic one.
  The total thickness of these horizons amounts to 170-180m.
  - In wadi Thora area, the coal-bearing horizon attains a thickness from 65-85m and increases to 104m due north. In the area of Wadi Bedan (Duda), it decreases to 30 M.
  - The coal-bearing horizon is made up of coaly mudstones, and mudstones with interbeds of sandstones, siltstones, clayey sandstones and coal. This horizon is well developed over a considerable area.

:- COAL SEAMS

The coal -bearing horizon attains its maximum thickness at Thora area. The main coal seam occur in the upper part of the horizon, whereas a coal band is traced in the lower part.

:- The area of deposit is highly faulted into blocks of various sizes.

:- Results of Exploration

- Coal seams and bands were found within the coal-bearing horizon and within the below-coal horizon as well. The other horizons contain only beds of coaly mudstone.
- The coal-bearing horizon was best studied, being traced by adits, pits and drilled-holes.
- The most persistent and the thickest coal seam is confined to the Upper part of the horizon, though it occasionally wedges into coaly mudstone.
- The coal is black, with a high ash content (20-30%). The Sulphur content is normally between 0.5-1.5% .
  The yield of volatile matter ranges from 17-23%.

- In Thora area, the main coal seam has an average thickness of 65-70 cm. In the Bedaa area, this main coal seam is only recorded in the southern sector.

- In the below-coal horizon, numerous very thin seams (5-10 cms) are recorded. However these thicknesses are not considered as reliable due to the low core recovery and lack of logging data.

- The Thora and Bedaa coal in general, is considered as a durain long flame, high-ash humic coal with a high yield of resin and gas. It was recommended for use for the production of liquid fuel and chemical products (Phenols and pyridine), as well as of a gas (450 m3/ton) with a high calorific value.

- Coal reserves

  Calculation of reserves was only carried out on the Thora coal deposit.

  - The proved reserves of the 0.55-0.8 m thick main coal seam, which occur at a depth of 15-60m over an area of 1.6 KM^2,

amount to..... 1.5 million tons.

- The probable reserves within an area of 3.5Km (adjoining the area of detailed investigation), amount to .....
  60 million tons.
- Possible geological reserves within an area of 200 Km^2, amount to .....
  60 million tons.

3.2- WESTERN DESERT COAL OCCURRENCES

3.2.1- FAYUM AREA.

- Staring from 1930, the Geological Survey of Egypt, began to execute a program for the exploration of the coal occurrences recorded within the geological section exposed at the northern borders of Fayum depression . This is the area of Qasr-El Sagha, located at a distance of 80 km southwest of Cairo.
- Early in 1905, the occurrence of lignitic bands and lumps within a sandstone bed were recored.
- The present program covers the detailed geological mapping of the area of Gebel Qatrani (Tar-Hill), where the geological section is studied carefully.

- Several coal seams are recorded (25-70 cm thick) within sediments of Upper Eocene and Oligocene, being mostly of Sandstones with marls and mudstones.
- The Coal seams have their exposed outcrops represented by oxidized ashy residual streaks that contain some coal debris.
- It is planned that during the years 1983 1984, an exploratory drilling program, of several wells (500 m each) will be executed to explore the extension of this coal and its geological setting.
- The chemical anelysis of some coal samples picked from the excavated trenches along the coal outcrops shows the coal to be of bituminous grade with a fixed carbon content of about 35-40% and a high content of volatile matter.

3.2.2- OTHER RECORDED OCCURRENCES IN THE WESTERN DESERT:

- A Project is now under execution as a joint program between the Egyptian Academy of Science and Technology, the Geological Survey of Egypt, and some Egyptian Oil companies. This project

aims to review and re-investigate the occurrences of coal and any carbonaceous matter recorded within the geological section of the deep wells drilled for Oil exploration.

- Several wells located at distances of 110-180 km to the west and north-west of Bayum Depression, have records of Coal occurring at depths ranging from 170 to 520 m below ground surface. These are mesthy found within the sandstones and shales of Miocene age.

- The present program entails the correlation of the electric-log records against the geological section and the investigation of any cored samples previously taken from these carbonaceous matter. Side coring was done in some wells to obtain new and fresh coal samples from the most promising sites

- In the area of Kharga-Dakla Oases, some very thin coal streaks were recorded during the drilling for ground-water exploration. This coal is found within the sandstones of Jurassic to Cretaceous age. Results

of the exploratory drilling for coal at Kharga Oasis (1968) did not encourage further exploration

.'. RECORDED COAL OCCURRENCES IN OTHER AREAS.

- There are still other recorded occurrences for the presence of coal in several areas of Egypt.

- The most striking occurrence is at a location 30 Km north-east of Cairo, at Gebel Kamer.
A well drilled for oil, showed the presence of coal measures at a depth between 788 to 860 m below ground level, in sandstones of lower Cretaceous age. A sample of the coal cuttings was analysed and gave the following results :

Humidity	2.36 %
Ash content	19.75 %
Volatile matter	31.83 %
Fixed Carbon	39.10 %
Sulphur	I.I8
Calorific Value	8775 cal/gr.

- It is planned during the year 1984, to sink a deep bore-hole at this site to obtain complete cored samples from this coal

4- [illegible]

4-1- Explorations:

All the exploratory work for the development of the Safa Coal mine in the Asfouri coal field was carried out during the period 1964-1967. This work was restored from the previous chapitre.

4-2- Evaluation of Reserves:

- Prior to 1967, the coal reserves of the Safa Block (25 km²), were evaluated as thus:

- Proved reserves:	[illegible] million tons
- Probable reserves:	[illegible] "
Total	21.8

- The net workable reserves, which could be mined, were evaluated (in millions tons) as:

- Proved minable reserves:	27.8
- Probable minable reserves:	7.8
Total	35.6

- It was planned, in 1967, to start production at an annual output of 150,000 tons, to be raised to 300,000 tons after 3 years.
- During the year 1968, a new feasibility study was carried on the Safa Coal mine to plan for a new project to re-open the mine that was closed and abandoned since the Sinai war in 1967.

- Coal reserves at Safa Block were re-evaluated, as workable reserves, after excluding the areas of stand-offs, faults, and splits. This gave the following calculations:

a- Main Coal seam reserves:

- Proven and indicated reserves: 26.2 m.t.
- Inferred reserves: 0.5 m.t.
- Total reserves: 26.7 m.t.

b- Upper Seam reserves:

- These are approximately million tons of sub-economic reserves.

4-)- Development of Safa Mine:

- The existing Safa Mine was developed over several years, beginning with prospecting work in 1959. Mining work began in 1964 and continued until the outbreak of the Sinai War in 1967, when the mine was abandoned. By that time two drifts and one shaft had been completed, together with two short longwall faces. The total length of underground drivages amounted to 3500 m. The mine was completely equipped to start production in July 1967, at an annual rate of 150,000 tons R.O.M. coal to be increased after 2-3 years to 300,000 tons.

- Recovery and rehabilitation work carried out recently has resulted in the drift entrance being reopened. The drifts and shaft are found in excellent condition, but much of the underground workings are flooded.

- The feasibility study carried out during 1982, covered all major operations, starting from a new design of the mine, washability of coal, its transport to points of main consumption, the optimum size of production, the utilization of coal, and all related financial aspects.

- It is recommended in this study that a fully mechanized retreating longwall system be introduced. To produce 0.6 million tpa, two production faces operating two shifts/day would be required.

- The principal benifit of the exploitation of Lagbara coal would be the substantial foreign exchange savings arising from the displacing of imported coals.

4-4- Additional Coal Reserves at Lagbara

- During the period 1981-1983, a drilling program was executed in the area west and north-west of Safa block. The results of this drilling showed the Main Coal seam to attain an average thickness reduced than its economic average thickness in the Safa block. However, the Upper coal seam was found well developed and to attain a considerable average thickness

that could permit for its economic exploitation. The Geological reserves being calculated in this area amount to 20 million tons. The quality of this coal is identical with that of the Safa block.

5- UTILIZATION OF COAL

- Prior to 1967, detailed laboratory, and semi-industrial examination of the Maghara coal resulted in recommending its use for steam-raising, low and high temperature carbonization, producer gas manufacture, total air or oxygen gasification, pulverised fuel for steam raising, smelting, sintering and furnace heating.

5-1- Metallurgical uses:

- As the Maghara coal has weak coking properties it could be used as a blend coal with high grade foreign coals. The percentage blend, which would depend upon the properties of the imported coal, showed that the blend would be likely between 10-25% .

- The Nasr Coke Works, is the sole producer of Coke required to feed the Iron and Steel Plant at Helwan, south of Cairo. At present, the current imports of Coking Coal amount to 1.5 million tons per

annum. The Coke works are of the opinion that Maghara coal could be used as a blend with imported Coal, either a 10% blend, if less than 10% ash and 3% sulphur, or a 20% blend if washed to less than 2% of sulphur, which would amount to a consumption of Maghara Coal of 150,000 or 300,000 tpa respectively. The exact blend would be determined using large scale pilot testing equipment currently being installed at the Works.

5.- Electricity Generating Market:

- A dual-fired power station (coal and either gas or oil) is planned to be built in Sinai, at Ayun Musa, on the nothern closure of the Gulf of Suez. A feasibility study is currently undertaken, with consideration of using the Maghara coal. This will require at least 1.5 million tpa of coal by mid-1987 to be raised to up to 3 million tpa after 2 years.

6.- FUTURE PROSPECTS:

- The National Five year Plan for the economic development of the country for the period 1982-1987, in currently under execution. The role of coal in accelerating the economic growth of the country is seriously considered in the 5-year plan. Three

governmental central agencies are involved in the development of coal deposits, in the assessment of more potential reserves, and in promotion of their utilization, either for metallurgical uses or as a source of energy.

6-1- Ministry of Industry and Mineral Wealth:

The role of the Ministry of Industry and Mineral Wealth is mainly represented by the projects under execution by Egyptian Geological Survey and Mining Authority, in the field of exploring new coal deposits anddeveloping the currently known deposits. The Maghara coal field, being of the most promising coal potential, is receiving condensed efforts for its development to start its production by 1987. Other areas of known coal occurrences will be investigated during the current plan.

The Nasr Coke Works, the main consumer of Coking coal, a state-owned Company, is affiliated to the Ministry of Industry and Mineral Wealth. Consequently all efforts for the optimum utilization of Maghara coal are proceeding in harmonized coordination.

6-2- Academy of Science and Technology

- The Egyptian Academy of Science and Technology through cooperation with the Egyptian Geological Survey and the Ministry of Petroleum has launched a joint program for the exploration of more prospecting coal deposits through the appraisal and re-investigation of Geological data obtained from deep wells drilled for oil exploration. This program started in 1982, and its first stage has been completed, by a team of geoscientists. The program entailed the investigation of all deep wells drilled for oil during the period 1967 to 1981. A number of 586 wells were thus covered through this study that included the revision of their basic Geological data, drilling records, electrical logging analyses, depth and thicknesses of any coal occurrences, chemical analyses of available samples, correlation of data, identification and location of more promising areas.
The second phase of this program which is currently under execution, is a continuation of the same research work on these wells being drilled in 1982-1983. This phase will be completed by the end of 1983, recommending more promising areas for coal occurrences in Egypt, to be

considered for further Geological exploration for coal.

(-3- Ministry of Energy and Electricity

- This Ministry being fully responsible for ensuring the requirements of energy on the National scale, is fully aware for the role of coal and its contribution as a source of energy for the country.

  By the end of the current 5-year plan, the Sinai electric generating station, 2 x 300 MW will be completed and starting its yield, which will be increasing later to 4 x 300 MW. This station will depend on the Maghara coal, at least on 500,000 tpa.

7- C O N C L U S I O N S :

- This paper, has thrown light on the position of coal in Egypt, and its role in accelerating the national economic growth.

- Egypt, being mainly dependant on its local oil production, and on the hydroelectric power generated at Aswan, has been, and is still being able to develop and exploit its sources of energy away form the utilisation of its coal deposits.

- It is evident that the Sinai War of 1967, has caused the operations of developing the Maghara coal field (Northern Sinai) to be stopped. The current development 5-Year plan is aiming to overcome this delay and to resume coal production by 1987.

- The existing of Coke Ovens and the Iron and Steel Works in Egypt, offers a good market for the Egyptian coals to be used for metallurgical purposes.

- Due to the existence of limited coal reserves, so far evaluated in Egypt, and to the presence of local markets for its consumption, it would not be easy for Egypt, to manage to release any of its coal production for export to foreign markets.

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